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AUTHOR Obertino, Pricilla; And Others
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ABSTRACT

This description of computer-based courseware for a beginning reading curriculum developed by the PLATO Elementary Reading Project indicates the philosophical approach to lesson development and describes the interactive capabilities of the system, as well as the types of visual displays, routines for data collection by teachers, and uses of the various features of the PLATO IV terminal. Typical lessons are illustrated for each of the 17 categories which are currently available and teacher management options are outlined. A schematic diagram of the PLATO IV system and detailed descriptions of the plasma display panel, output and input devices, and the terminal keyset are included. (CMV)

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Elementary Reading on PLATO IV

1977

PLATO Elementary Reading Staff

Pricilla Obertino, Director

Leslie Fillman
Jim Gilfillan
Dorothy Silver
Robert Yeager

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Computer-Based Education Research Laboratory
University of Illinois, Urbana-Champaign
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INTRODUCTION TO THE PLATO ELEMENTARY READING PROJECT

Begun in June of 1971 under NSF contract C-723, the goal of the PLATO Elementary Reading Project has been to develop a beginning reading curriculum for first-grade children, to be presented on the PLATO IV student-author terminal. With animated visual displays that are touch-responsive, random-access audio, and random-access color slides, PLATO IV offers a flexible interactive medium for instruction. Approximately 200 lessons comprising 1500 separate exercises in 17 lesson categories have been developed over the course of the project. During the past three years, the project has used PLATO IV terminals installed in regular classrooms to deliver an average of fifteen minutes of instruction daily to 1500 children in nine public schools. Twenty-five teachers have participated in the implementation.

Lesson development has been guided by the philosophy that children should control the terminal, rather than being restricted solely to responding to stimuli presented by the terminal. This approach has been followed both within and among lessons. As often as possible, children are given an informed choice as to which activity they will pursue. For instance, at the end of each lesson, students can choose either to go on to the next lesson or to repeat the previous lesson. In addition, teachers may decide to set up indexes of activities from which children are free to select.

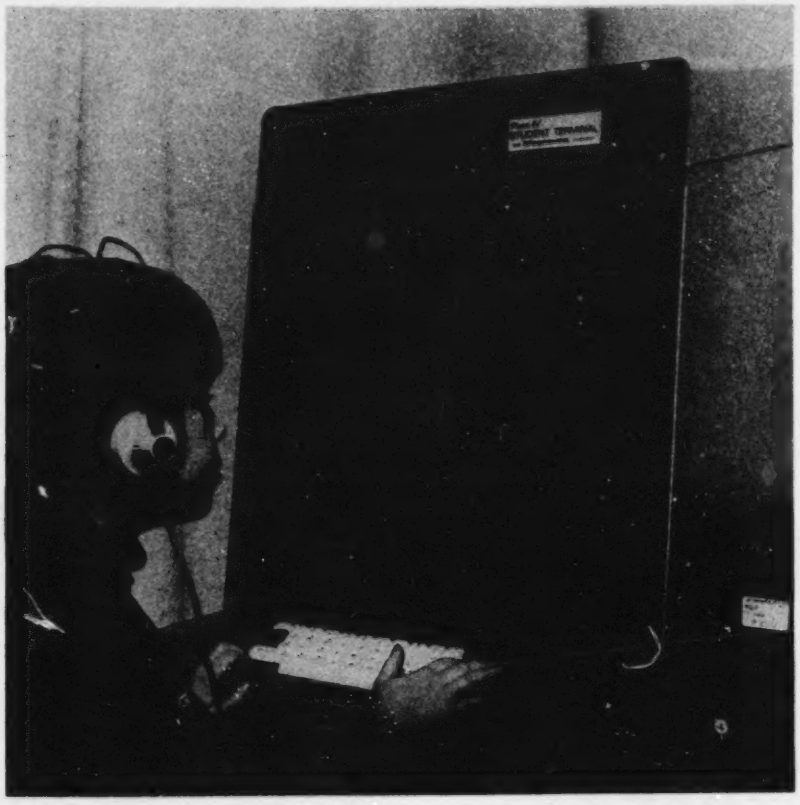
As well as designing individual lessons, the project has developed a number of routines which automatically collect student performance data and which enable teachers to control how PLATO is used in their classrooms. These services allow flexible implementation of the medium, permitting teachers to integrate PLATO resources into their own instructional programs for initial teaching, review, enrichment, or reinforcement. At the same time, student performance data feeds back to teachers information they need to make intelligent instructional decisions. Efforts are still underway to build degrees of automation within predefined lesson sequences. The purpose of this limited automation is to facilitate assigning lessons to students without removing decision making from the teacher's hands.

Presently, attempts are being made to develop activities for children beyond the first grade level. In particular the reading staff is beginning to address the problems of children with various kinds of language comprehension difficulties. Hopefully, these efforts will form the basis of a comprehensive program in the language arts for all intermediate-level elementary students.

PLATO IV HARDWARE

The PLATO IV Terminal

The PLATO IV terminal features a unique display panel which allows both static and animated display of standard and author-designed characters. Since the display panel is flat and transparent, these computer-generated characters can be shown simultaneously with rear-projected full-color slides. In addition the terminal can be equipped with a touch-sensing device which allows the student to interact directly with the visual display. Finally, each terminal has two external output jacks which allow attachment and computer control of a variety of auxiliary devices. The most important of these for teaching non-readers is the random-access audio device, which delivers prerecorded messages to the student at appropriate points in the lessons. (For a detailed description of the PLATO IV system, terminal, and auxilary devices, please see section V, "The PLATO IV System.")



Signing-in

The child makes use of both a special function key and standard alphabetic keys to gain access to his or her lessons. The procedure is simple: 1) press "NEXT" 2) type name (usually first names or nicknames are used) 3) press "NEXT". Children make use of the keyboard within lessons, too. Often they are asked to type the words or letters they are studying. Very early, children perceive the keyboard as being the most powerful way of controlling the medium, since adults use the keyboard for such operations as sending notes, using the on-line "talk" option, and prescribing lessons for students. Teaching five to seven-year-old children to sign in and to load audio discs and microfiche efficiently and independently usually takes from one to three ten-minute sessions with a human helper.

The Touch Panel

The touch panel allows the terminal to sense the point on the screen where the child has touched. The lesson program, in turn, interprets that touch as being a correct, incorrect, or inappropriate input; the lesson then responds accordingly. By allowing the child to interact with pictures, animations, sentences, words, and selected subsets of letters and numbers, the touch panel presents a powerful dimension of interaction not offered by the keyset or visual display alone.

The Random-A[illegible]cess Audio Device

The r[illegible]ndom-access audio device can play back, under computer control, any[illegible] of twenty-two minutes' worth of prerecorded messages. These messag[illegible]s can range in length from .3 seconds to 42 seconds. Each message can [illegible]e accessed within .5 seconds. Simple enough to be operated by kindergar[illegible]eners, the device is indispensible to the delivery of instruction [illegible]o non-readers or beginning readers. The close, interactive relationship[illegible] between what children hear over the earphones, what they see on the s[illegible]reen, and what they do with the terminal has both improved the listenin[illegible] skills of normal children and showed promise in the instruction of chil[illegible]ren with auditory central processing problems.

Random-Access Slide Selector

The random-access slide selector allows rear projection under computer control of any one of 256 full color images embedded on a single microfiche. The flat, transparent plasma display panel permits simultaneous display of both the microfiche image and computer-generated graphics. Reading activities make most notable use of this capacity in touch-sensitive stories, which display both the text and full color illustrations of selected stories. As the picture shows, a child can easily slip the microfiche into its holder through the small door at the top of the terminal.

SURVEY OF ACTIVITIES

The elementary reading lessons and exercises currently available on PLATO fall into the following categories:

1) Orientation

2) Date Activities

3) Letter Discrimination

4) Word Detail

5) Memory Skills

6) Letter Names

7) Alphabet

8) Letter Sounds

9) Blending

10) High-Frequency Sight Words

11) Enrichment Sight Words

12) Word Meanings

13) Sentence Building

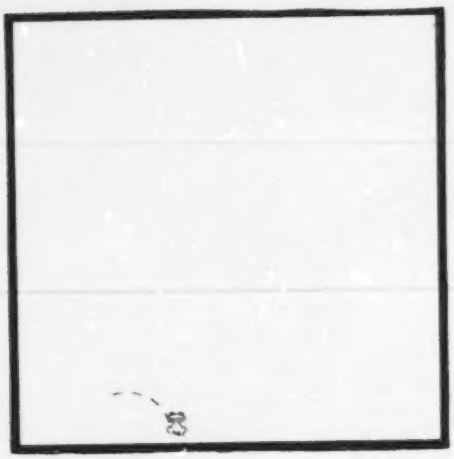
14) Stories

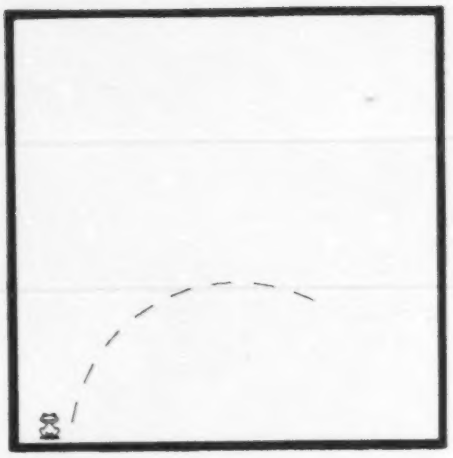
15) Timed Reading

16) Stories Written by Students

17) Games

The examples that follow illustrate typical lessons in each of these categories. Many of these lessons can be prescribed in different parts and levels of difficulty, according to the child's previous experience and academic needs.





Category - Orientation

Lesson Name - Freddy Frog

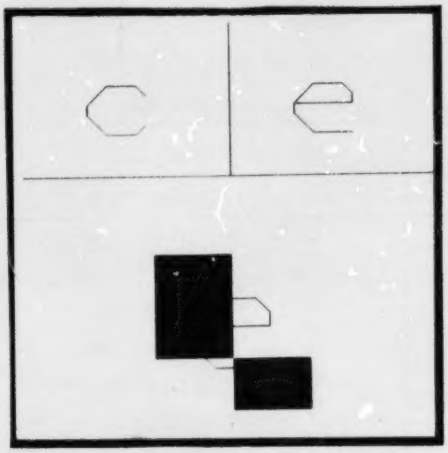
When the student touches Freddy Frog, he hops. This activity teaches students that they can interact with the visual display by touching it. The orientation category also includes lessons for practice in using the keyboard and typing one's name.

Category - Date Activities

Lesson Name - Today is ...

Happy Halloween

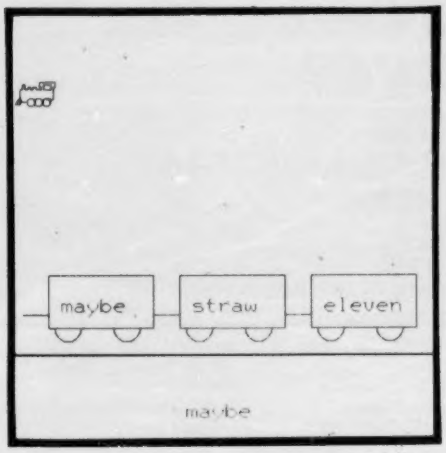
These lessons teach students the days of the week, the months of the year, and how to read a calendar. PLATO celebrates holidays with special displays. One such display wishes the child a "Happy Birthday."

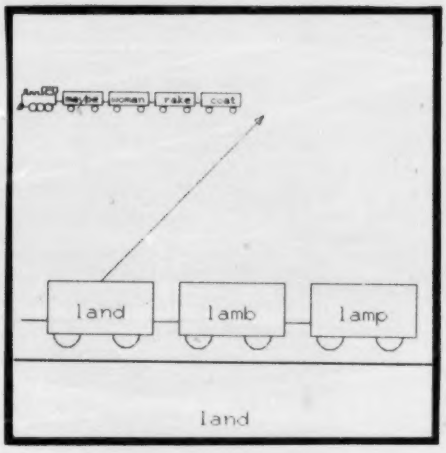


Category - Letter Discrimination

Lesson Name - The Hiding Letter

To begin to learn to read, children must develop the ability to discriminate letter forms. In this lesson, the hidden letter is identical to one of two letters displayed at the top of the screen. Students uncover the "hiding letter" piece by piece until they see enough to be able to match it to one of the letters at the top of the screen. This strategy, which is also used in word-matching exercises, encourages children to discover distinguishing characteristics of word and letter forms.

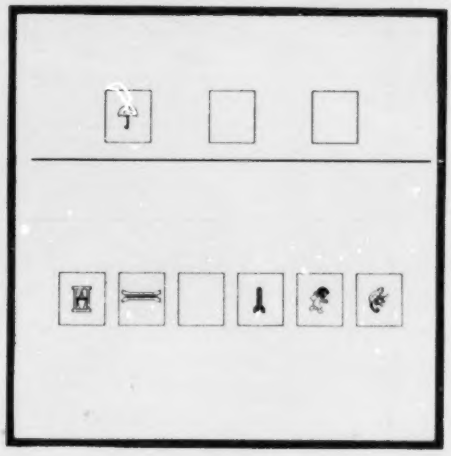




Category - Word Detail

Lesson Name - Make a Train

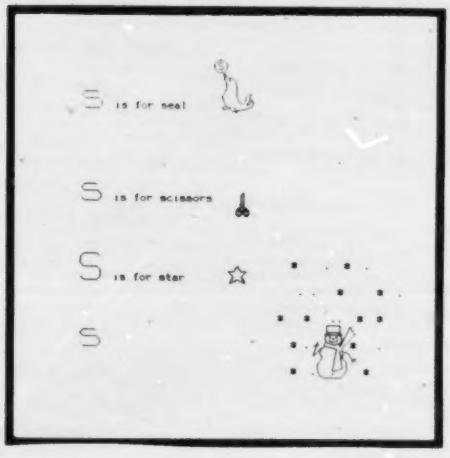
In this activity students match the word at the bottom of the screen with a word in one of the large train cars. Every time a word is correctly matched, a car is added to the train. The field of words in which the target word is embedded can closely or minimally resemble the target word.



Category - Memory Skills

Lesson Name - The Memory Game

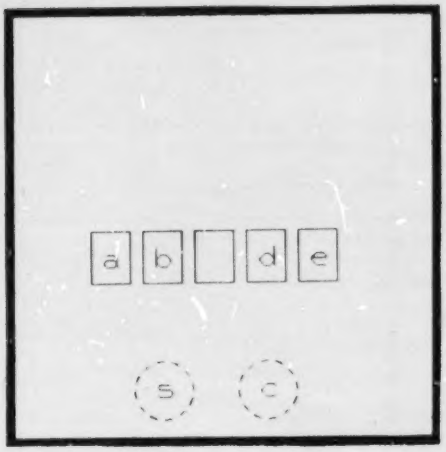
Intended to improve short-term visual memory, this game has two versions. In one version, PLATO displays an initial set of pictures. When the child presses a key PLATO erases all the pictures, then re-displays them with several "new" pictures added. The student is asked to touch all the "old" pictures, the ones that appeared on the screen before it was erased. In the second version, the student is asked to touch all the "new" pictures, the ones which PLATO added to the old sequence. The teacher can set the number of items to be remembered at one time, thereby controlling the level of difficulty.

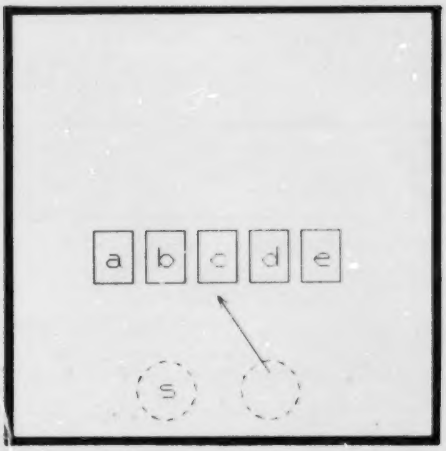


Category - Letter Names

Lesson Name - Picture Dictionary, S is for...

Picture dictionary activities give the student practice in letter identification. The student sees the letter by itself and at the beginning of words. Pictures and animations invite the child to interact with the letter. In some follow-up exercises, students identify the isolated target letter in a field of other letters. In others, they pick out words that begin with the target letter.

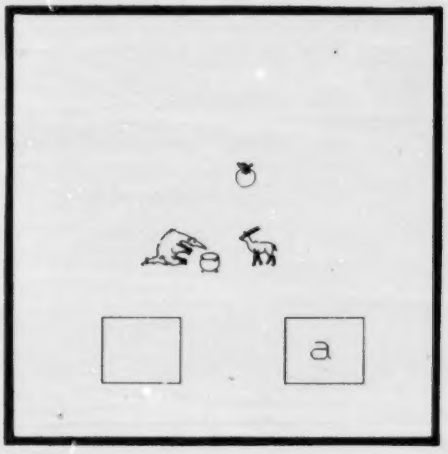




Category - Alphabet

Lesson Name - The Missing Letter

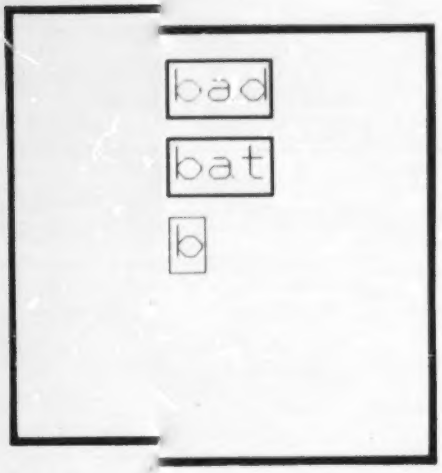
In this lesson, one letter of a five-letter alphabetical sequence is left out. The student is to choose the missing letter from among the alternatives shown.



Category - Letter Sounds

Lesson Name - Andrew Anteater

Andrew Anteater and Alice Antelope help teach the sound of short a. If a word starts with short a, the student puts it in Andrew's soup. If the word does <u>not</u> start with short a, the student puts it into the empty box. This category also includes lessons requiring more complex sorting by sound, plus alliterative stories.



Category - B
lending

Lesson Name
- Make B-words

In th
consonant wo
make words t
they pick th
time a word

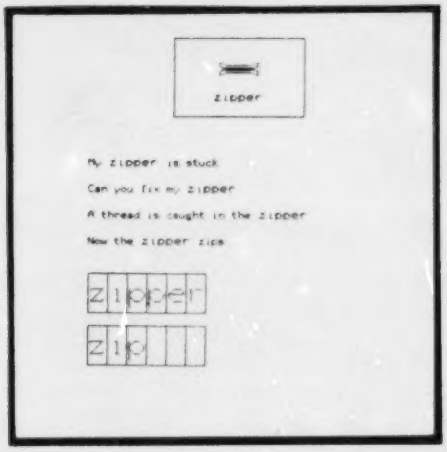
is activity, students practice putting consonant-vowel-
rds together. In the frame on the left, the students
h t start with "b." Next, in the frame on the right,
e ords they made out of a field of other words. Each
is dentified correctly, a star lights up.

Category - H
igh-Frequency Sight Words

Lesson Name
- High-Frequency Sight-Word Drill

"High
which occur
picturable,
of short pa
and in sent
field of ot

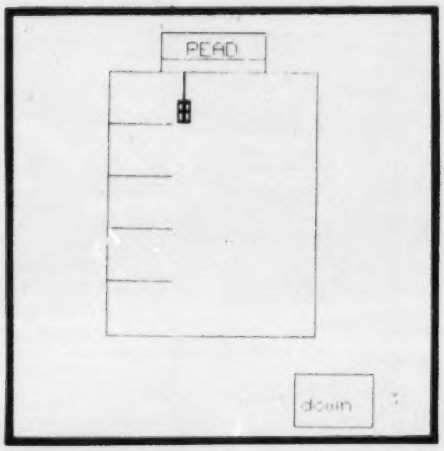
frequency sight words" are those common relational words
frequently in text. Because many of these words are non-
a heavy emphasis is placed upon the word in the context
ssages. The child both hears and sees the word in isolation
ence context, then types the word and identifies it in a
er words.

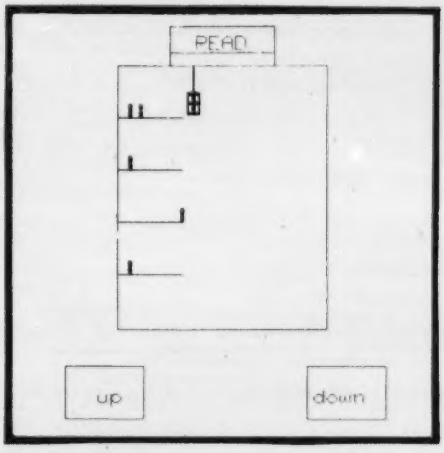


Category - Enrichment Sight words

Lesson Name - Enrichment Sight-Word Drill

This drill is nearly identical to the High Frequency Sight Word Drill except in the actual words employed. "Enrichment" sight words consist of picturable words of high interest. As in high-frequency drills, the purpose of the lesson is to assure that the child both associates meaning with the word and can identify it by sight, alone and in context. In the course of the exercise the child sees the word in sentence context, types the word, and identifies it from a field of other words.

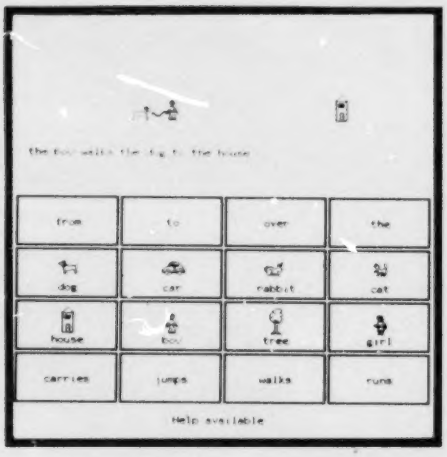




Category - Word Meanings

Lesson Name - Elevator

This activity is an example of those which give the child an opportunity both to learn words by sight and to use the concepts conveyed by the words. In "Elevator", the little animated characters request via audio to go "up" or "down". The child makes the elevator respond by touching the appropriate words. This type of lesson has proved to be highly popular with both normal and language-delayed children.



Category - Sentence Building

Lesson Name - Make a Sentence

A selection of words is displayed on the screen. The student chooses from this selection to form a sentence. When the sentence is complete, the student presses the "NEXT" key, and PLATO "reads" the sentence aloud. If the sentence is grammatically correct, PLATO then shows an animation of the action described. This activity is a good example of the kind of learner control computer-based lessons can offer.

Category - Stories

Lesson Name - SEE

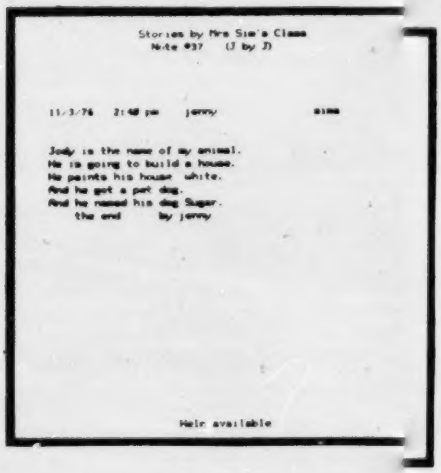
Stories in this category allow a child to read independently as much as possible. If help is needed, the student can touch the small square to the left of the line of print and hear that line "read" by the random-access audio device. These stories make extensive use of microfiche for full color illustration of the stories. This particular story was written by a teacher who has been involved with the PLATO reading program for several years.

A dog came to school today.
We all said hello to her.
She could not come in to play
because we had our work to do.
Poor dog.
She barked at us and went away.
She was so sad.
This is not a school for dogs.
Press NEXT

Category - Timed Reading

Lesson Name - Pacer Stories

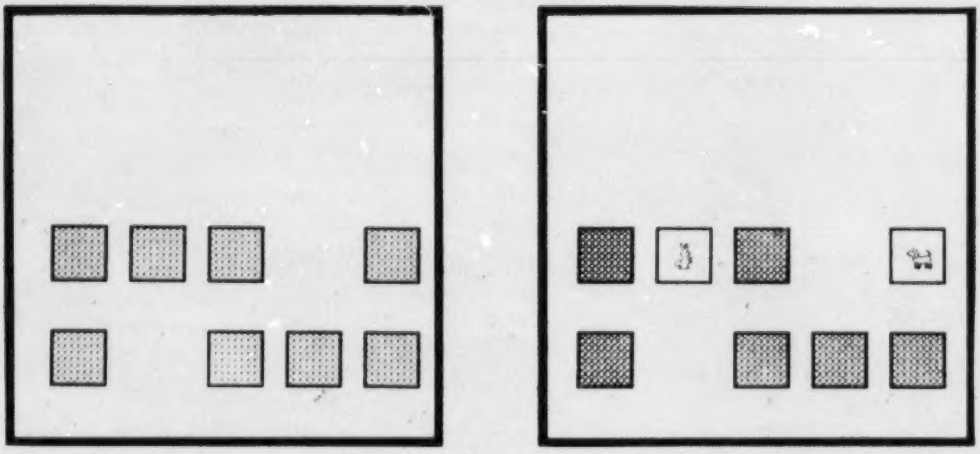
These activities represent the beginnings of experimentation with paced reading on PLATO. It has been found that allowing beginning readers to control how fast they read is more acceptable than having PLATO choose a speed and forcing the young readers to keep up. After a story has been read, PLATO displays the student's time and asks several multiple choice comprehension questions. In cases where a question has been answered incorrectly, the student is shown the appropriate passage to search for a correct answer. Students seem to enjoy racing against their own best time.


Stories by Mrs Sie's Class
Note #37 (J by J)
Jody is the name of my animal.
He is going to build a house.
He paints his house white.
And he got a pet dog.
And he named his dog Sugar.
the end by jenny
Help available

Category - Stories Written by Students

Lesson Name - Stories From Ms_____'s Class

Student story files allow students to type their own stories on-line. The compositions are then stored in a computerized "library", which can be accessed by both teachers and other students. The motivational possibilities of this activity are just beginning to be explored. Experience to date shows, however, that students produce longer compositions on PLATO than they do on paper.



Category - Games

Lesson Name - Concentration

In this game of visual memory and discrimination, the student must find two boxes that match by touching them to cover and uncover the figures underneath. To play efficiently students must both discriminate identical figures and remember under which box a given figure is "hiding."

TEACHER MANAGEMENT OPTIONS

The teacher management options are designed to allow the classroom teacher to control how PLATO is used in her classroom without adding too much work to her already busy schedule. The teacher needs to be able to do three things: 1) select activities for each student; 2) get information about how each student performed; and 3) communicate with the PLATO staff and with other teachers.

Prescribing

A teacher uses an index of all currently available activities to decide which activities to give to each student. She makes up a list of activity numbers and types them into a lesson called the "prescriber." For each student, she can make up three different lists:

1) Main activities consist of the primary instruction for a student.
2) Start the Day activities are done every day at the start of each session.
3) Extra activities are done if the student finishes all of the main activities.

The teacher can give the list of activities to one, several, or all students. She can also look at any student's current list of activities and change it.

The "prescriber" also lets the teacher set other options:

1) Session time: most teachers like their students to have fifteen-minute sessions.
2) Number of activities: some teachers prefer that students finish a certain number of activities each day rather than spend a fixed amount of time in a session.
3) Auto-prescribing: the teacher can specify that lessons which a student has failed should automatically be kept on the list for the following day.

Once the teacher has prescribed a list of activities, her students can sign in and be automatically routed from one lesson to the next; the student need only interact with the lessons.

Teachers typically spend one one-hour session per week to prescribe for a class. Many teachers, however, add special activities to individual student's lists throughout the week. One of the goals of the PEP staff is to study teachers' lesson management needs and practices and to make prescribing faster and simpler.

Data

There are two main types of data available to teachers: 1) data about the lessons completed by students; and 2) cummulative data which

reports the student's progress in about four hundred objectives. Teachers can look at these data either by individual student, or in a summarized form for their whole class.

Data on lessons completed gives the following types of information:

a) Date on which the lesson was taken;
b) The student's score, reported as "good", "fair", or "poor";
c) Lesson completed information showing whether or not the student reached the logical conclusion of the lesson;
d) Time the student spent in the lesson;
e) Number of times the student chose to repeat the lesson.

Skill data summarizes a student's performance in many lessons. Examples of the four hundred objectives are:

1) visual discrimination -- discriminates rotated letters
2) letter names -- knows the letter name "a"
3) auditory discrimination -- recognizes the sound of short "a"
4) sight words -- knows the word "the"
5) word meanings -- understands the meaning of "up"

Skill data is reported to the teacher as:

a) known
b) ready for a criterion test
c) needs work
d) no information on the skill yet

Communications

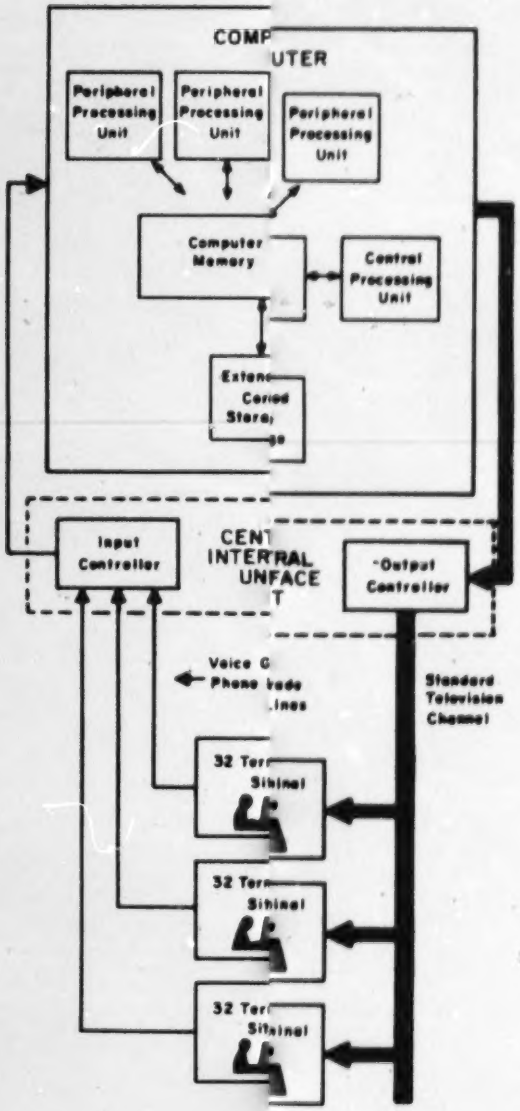
Teachers use standard methods of communicating that are available to all instructors on the PLATO system.

PEP News is a public notes file in which teachers make comments and ask general questions and in which the PLATO staff makes announcements.

Personal Notes are like electronic letters sent from one person directly to another. They are personal and can only be seen by the person to whom they are sent. Teachers use personal notes to communicate directly to a person on the PEP staff; and they often use them to keep in touch with fellow teachers at other schools.

Talk is like a telephone call except that the two people type to one another instead of speaking. The "talk" option allows instantaneous communications so that a classroom teacher can get immediate information.

SCHEMATIC DIAGRAM
OF THE PLATO IV SYSTEM



The PLATO IV System

The center of the system is the Control Data Corporation CYBER 73 computer system. This system is composed of a magnetic disk system, peripheral and central processing units, and main and auxiliary computer memory. A unique operating system, which includes the high level TUTOR language, takes advantage of Control Data Corporation's Extended Core Storage to swap user programs in and out of the computer 100 times faster than standard time-sharing systems. A magnetic disk library contains 3500 hours of tested materials in more than 100 subject areas.

There are currently 940 terminals connected to the system. The computer and terminals communicate with each other over voice-grade phone lines through the Network Interface Unit and its subcomponents, the Site Controllers. Simultaneous use by 400 terminals is common. Terminal usage amounts to more than a million hours per year.

These 940 terminals are located locally and as far away as the east and west coasts of the United States. Remote on-line demonstrations have been given in Canada, Europe, and the Soviet Union.

The author language, TUTOR, is simple yet flexible. The language, along with text and graphic editing aids, facilitates production and revision of lessons from any terminal even as students concurrently use the system. The author language does not restrict the use and development of new teaching strategies. This freedom from bias allows authors to develop individualized instruction for students with different styles and rates of learning.

Several PLATO systems exist currently and electronic interconnection allows intersystem communication and sharing of courseware.

The PLATO IV Terminal

Perhaps the most interesting feature of the PLATO IV terminal from an instructional point of view is the plasma display panel. This transparent, flat glass panel measuring 8½" square contains a 512 x 512 grid of 262,144 individually digitally addressable points in the form of tiny neon gas cells. The plasma technology means that images on the screen remain sharp without the constant refreshing by computer required by cathode ray tubes. The panel can display 2048 characters in a format containing 32 lines of 64 characters each. Characters are written at a speed of 180 per second. Line drawings can be displayed at the rate of 60 connected lines per second. There are 252 available characters; 126 are wired in and 126 are user-designed, loadable into the terminal's character memory under computer control.

In addition to possessing highly flexible display characteristics, the PLATO IV terminal is also equipped to handle auxiliary output and input devices. One of the most important of these is the touch-sensing panel, which enables the computer to process as inputs touches on the screen display (see page 4). Two output jacks and one input jack on the back of the terminal allow various devices to be attached and controlled by the computer. The most common auxiliary devices now in use include:

a random-access audio device
an electronic music generator
an electronic speech generator
printers
mini and micro computer systems
video tape recorder
TV monitor controller

The PLATO IV terminal includes a keyset featuring all standard typewriter characters, special function keys, and mathematical characters. The keyset is the conventional input device used by both authors and students.

The Touch Panel

The touch panel, a matrix of infared light-emitting diodes and sensors bordering the terminal screen, allows input by touch at any of 256 screen locations. The panel looks like a shallow frame around the display window and mounts on the face of the terminal.

The Random-Access Audio Device

The audio device uses a mylar magnetic disc 15 inches in diameter, which holds up to 22 minutes' worth of prerecorded messages. Message lengths can range from .3 seconds to 42 seconds. Average access time is .5 seconds. Like the random-access slide selector, the audio device is driven by pneumatic pistons. Discs are loaded through the access door on the front panel.

The Random-Access Slide Projector

Driven by pneumatic pistons, the slide projector is positioned in the top of the terminal. By an arrangement of mirrors, it projects full-color images through the back of the transparent plasma panel. This configuration allows superimposed slide images and computer-generated graphics. The microfiche format features 256 colored slides grouped 16 by 16 on a 4 inch by 7 inch sheet of plastic. The average access time per image is .2 seconds. The microfiche card is loaded through an access door near the top of the terminal.